CLAIMS

1. A method of forming a diffusion barrier on a titanium alloy substrate, the method comprising applying to the titanium alloy substrate a coating comprising a source of a ceramic-forming metal oxide and a source of a phosphate binder for the metal oxide, and causing the metal oxide and the phosphate to cure to form a diffusion barrier comprising a phosphate bonded ceramic on the titanium alloy substrate.

2. A method according to claim 1, wherein the coating is applied in one step.

3. A method according to claim 1, wherein the coating is applied as an acidic aqueous medium comprising the oxide source and the phosphate source.

4. A method according to claim 1, wherein the oxide source is selected from oxides and hydroxides of magnesium, aluminium, iron, chromium, sodium, zirconium and calcium, and any mixture or chemical or physical combination thereof.

5. A method according to claim 1, wherein the phosphate source is selected from phosphoric acid and phosphates of potassium, aluminium, ammonium, beryllium, calcium, iron, lanthanum, lithium, magnesium, magnesium-sodium, magnesium-potassium, sodium, yttrium, zinc, zirconium, and any mixture or chemical or physical combination thereof.

6. A method according to claim 4, wherein the oxide source is selected from magnesium oxide, chromium oxide and mixtures thereof.

7. A method according to claim 3, wherein the acidic aqueous medium further comprises one or more optional additional ingredients.

8. A method according to claim 7, wherein the one or more optional additional ingredient is selected from one or more of rheology modifiers, buffers, pH reducers, oxidising agents, reducing agents, other cure retardants and surfactants.

9. A method according to claim 3, wherein the acidic aqueous medium consists essentially of the oxide source, the phosphate source, water, and optionally one or more of rheology modifiers, buffers, pH reducers, oxidising agents, reducing agents, other cure retardants or surfactants, with less than about 10% by weight of other ingredients.

10. A method according to claim 1, wherein the coating is applied as substantially the following composition:

water (45-55 wt%)
phosphoric acid (15-25 wt%)
chromium trioxide (1-2 wt%)
chromium oxide (15-25 wt%)
clay (bentonite) (0.5-1 wt%)
magnesium oxide (2-3 wt%)
magnesium hydrogen phosphate (4-5%).

11. A method according to claim 1, wherein the coating is applied in a thickness of up to about 25μm.

12. A method according to claim 1, wherein curing of the coating is initiated by heating the coating.

13. A degradation resistant titanium alloy structure having a diffusion barrier disposed thereon, wherein the diffusion barrier comprises a phosphate bonded ceramic.

14. A degradation resistant titanium alloy structure having a diffusion barrier disposed thereon, wherein the diffusion barrier comprises a phosphate bonded ceramic formed by a method according to claim 1.

15. A structure according to claim 13, which comprises an aerospace component or a portion thereof.

16. A structure according to claim 14 which comprises an aerospace component or portion thereof.

17. A degradation resistant aerospace component comprising a titanium alloy substrate and a substantially uniform ceramic diffusion barrier disposed thereon, wherein the diffusion barrier comprises a phosphate bonded ceramic.

18. A structure or component according to claim 13, wherein the diffusion barrier has a thickness in the range of about 1 to about 10μm.

19. A structure or component according to claim 14, wherein the diffusion barrier has a thickness in the range of about 1 to about 10μm.

20. A structure or component according to claim 15, wherein the diffusion barrier has a thickness in the range of about 1 to about 10μm.

21. A structure or component according to claim 16, wherein the diffusion barrier has a thickness in the range of about 1 to about 10μm.

22. A structure or component according to claim 17, wherein the diffusion barrier has a thickness in the range of about 1 to about 10μm.